

WHAT IS CLAIMED IS:

1. A noise reduction apparatus for reducing noise propagated toward a predetermined space on one side of a wall from
5 an external noise source on another side of the wall, comprising:

a control sound source, which is placed on the wall so as to block a noise propagation path, for radiating a sound into the predetermined space;

a sound detector for detecting a sound propagated from
10 the noise source through the control sound source; and

a control section for causing the control sound source to radiate a sound so as to minimize a sound to be detected by the sound detector, based on results detected by the sound detector.

15 2. The noise reduction apparatus according to claim 1, further comprising a housing, which is attached to the surface of the wall so as to face the noise source, for generating space for noise reduction between the housing and the wall; wherein

the control sound source is placed on the housing
20 attached to the surface of the wall;

the sound detector is placed in the space for noise reduction; and

the control sound source radiates a sound into the space for noise reduction.

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3. The noise reduction apparatus according to claim
2, wherein

a plurality of housings are attached to the surface of
the wall adjacently to each other, and

5 the noise reduction apparatus further comprises a
vibration damping section for damping a vibration in a position
of a barycenter of each portion of the surface of the wall, which
is divided by the plurality of housings having space for noise
reduction.

10 4. The noise reduction apparatus according to claim
3, wherein the vibration damping section is a pole connecting the
housing with the wall.

15 5. The noise reduction apparatus according to claim
4, wherein the sound detector is connected to the pole.

6. The noise reduction apparatus according to claim
3, wherein the vibration damping section is a plummet placed in
20 the position of the barycenter.

7. The noise reduction apparatus according to claim
2, further comprising a film, which is connected to the housing,
for generating a closed space between the film and the control
25 sound source.

8. The noise reduction apparatus according to claim 2, wherein the control section is placed in the space for noise reduction.

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9. The noise reduction apparatus according to claim 1, further comprising a noise detector placed outside the predetermined space for detecting the noise, wherein

the control section generates the control signal based
10 on results detected by the sound detector and the noise detector.

10. The noise reduction apparatus according to claim 1, wherein the control sound source is a piezoelectric loudspeaker.

15 11. The noise reduction apparatus according to claim 1, wherein

the wall has a hole,

the control sound source includes:

a board connected to the wall so as to block the hole;

20 a vibrating component placed so as to face the predetermined space for forming an air layer with the board, and which is vibrated by a sound radiated into the air layer; and

a driver for radiating the sound into the air layer,

and

25 the control section causes the driver to radiate the

sound by the control signal.

12. The noise reduction apparatus according to claim
11, wherein the sound detector, which is placed in the predetermined
5 space, detects the sound by detecting a sound pressure and a phase
of the sound propagated toward the predetermined space.

13. The noise reduction apparatus according to claim
11, wherein the sound detector detects the sound propagated toward
10 the predetermined space by detecting a vibration of the vibrating
component.

14. The noise reduction apparatus according to claim
11, wherein the board and the vibrating component are made of a
15 transparent material.